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Author(s):	Richard L. Gustavsen, Stephen A. Sheffield, Robert R. Alcon, R. Winter, D. Salisbury and P. Taylor
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Double Shock Initiation of the Explosive EDC-37

Experiments Measure Buildup to Detonation (Initiation) Resulting from a Double Shock Wave in the Explosive. Buildup is Measured Using Embedded Electromagnetic Particle Velocity Gauges

R. L. Gustavsen, S. A. Sheffield, and R. R. Alcon DX-1, Los Alamos National Laboratory, Los Alamos, NM

R.E. Winter, P. Taylor, and D.A. Salisbury Atomic Weapons Establishment, Aldermaston, U.K.

<u>Introduction:</u>

Why do Double Shock Experiments in EDC-37?

Obtain Better Data on Double Shock Initiation

CLEAN Particle velocity wave profiles at 10 - 12 positions

Position -time (x-t) shock trajectories

Test "Rules of Thumb" for Double Shocks

Buildup only begins after the two waves coalesce

The single shock "Pop – Plot" will predict the run to detonation.

Data Tests Reactive Burn Numerical Models

What is EDC-37?

90% HMX

Liquid Binder

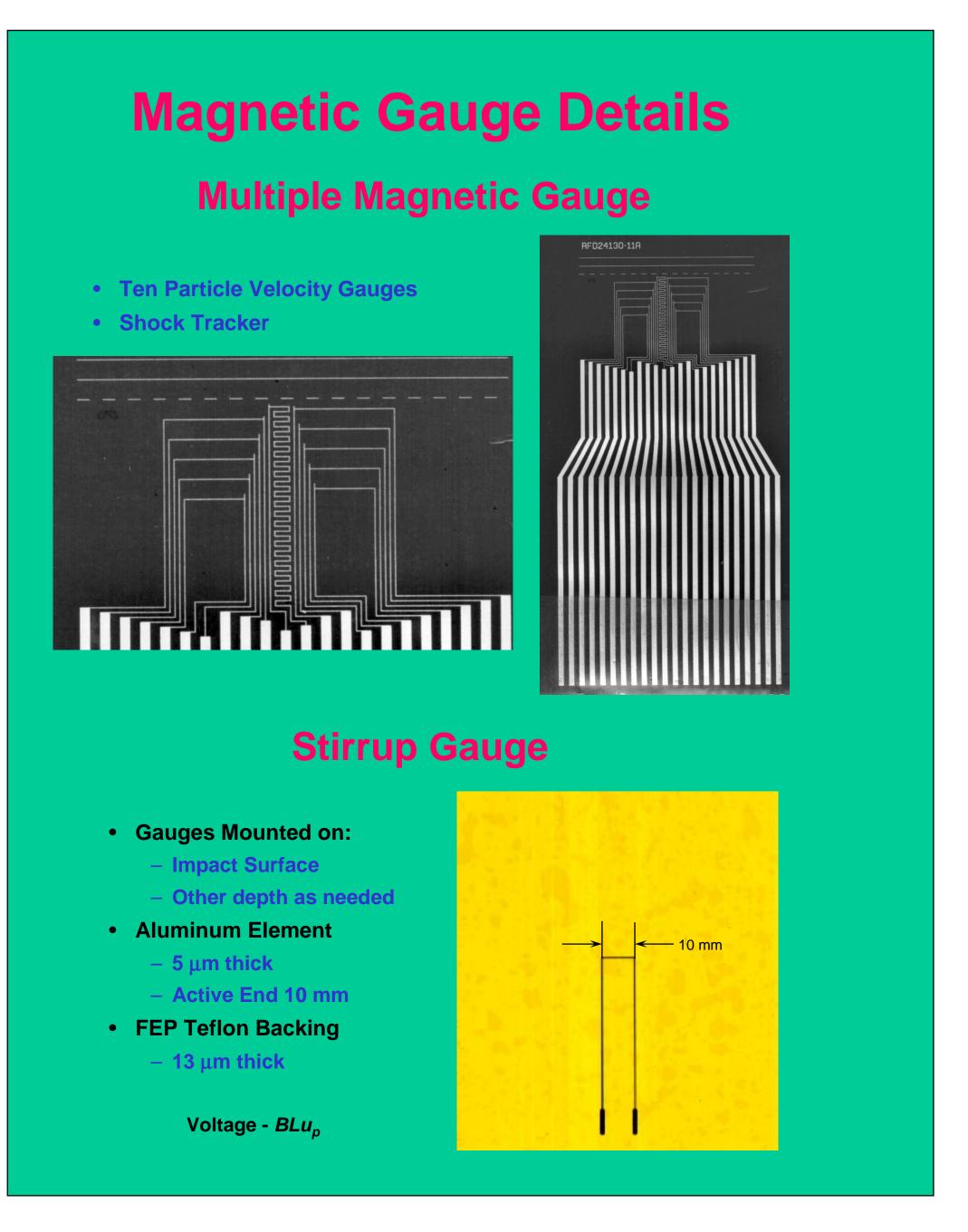
Mostly Fine (< 40mm) Particles

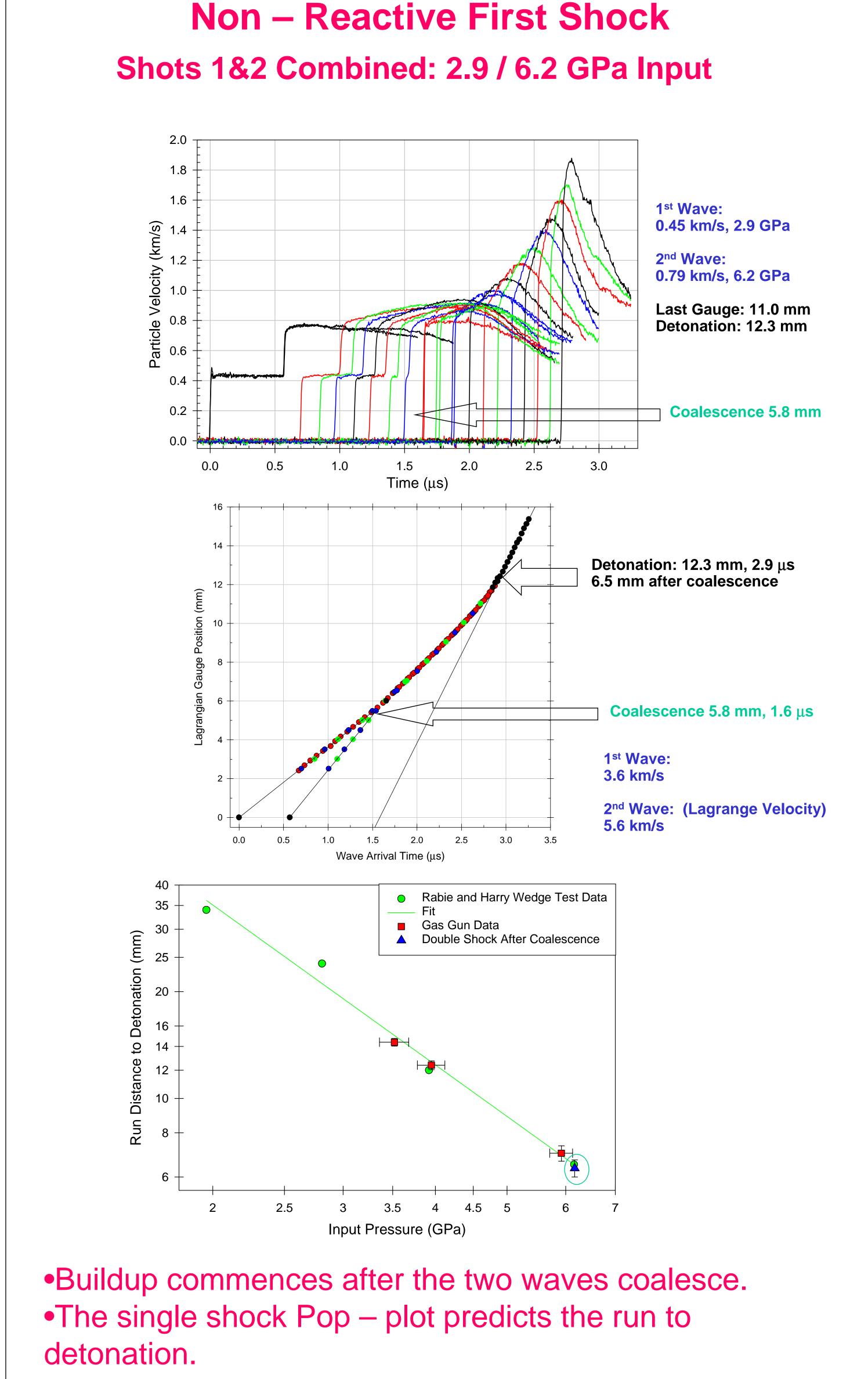
Very Low Void Content (< 0.3%)

Least Sensitive HMX based Explosive

Gauges Located at: 0, 2.5 - 7.0 mm (1st Shot) 0, 6.0 - 111.0 mm (2nd Shot) Lexan Projectile Kel-F (1-1.5 mm) •Kel-F launches weak wave into EDC-37 •Sapphire launches stronger, overtaking wave •6 mm cap may be used on front of explosive to place gauges at desired depth

Explosive Target Assembly Target in Gun Sample Sample Sample Sample Sample Sample South Assembly Assembly Target Plate Impactor Lexan Projectile (750 Gauss) Gun Barrel





•Shots 3&4 Combined: 3.9 / 8.6 GPa Input Longer Pulse Length 2nd Wave: 0.98 km/s, 8.6 GPa Gauges: 0.0, 2.4 - 10.9 mm ☐ Coalescence 7.0 mm Time (µs) Detonation: 8.4 mm, 2.0 μs 1.4 mm after coalescence Detonation: 9.4 mm, 2.18 μs 2.4 mm after coalescence **Coalescence: 7.0 mm, 1.8** μs 1st Wave: 3.93 km/s 2nd Wave: (Lagrange Velocity) Wave Arrival Time (µs) **Total Run** Rabie and Harry Wedge Test Data Run After Coalescence Gas Gun Data Double Shock After Coalescence 2.5 3 3.5 4 4.5 5 6 7 8 Input Pressure (GPa) Reaction before coalescence contributes to final buildup. •The single shock Pop – plot does not predict the run to detonation.

Reactive First Shock